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Trends of Breastfeeding Practice and Determinant Factors of Exclusive breastfeeding in Bangladesh: Evidence from the Six Nationally Representative Cross-Sectional Surveys

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ABSTRACT

Poor breastfeeding is found to be responsible for child adverse health and development problems. The aims of this study are to examine the trend of World Health Organization's (WHO's) recommended breastfeeding practices and determinant factors of exclusive breastfeeding (EBP). Data were extracted from six nationally representative Bangladesh Demographic and Health Survey (BDHSs). The WHO recommended indicators related to the breastfeeding practices were calculated. Multivariate logistic regression model was used to identify the factors associated with EBP with accounting complex survey design. Among the four indicators of breastfeeding practices, increasing trend was reported only for early initiation of breastfeeding among the surveys years. Multivariate logistic model explored mothers' age, occupation, place of delivery, number of antenatal visits were most important predictors of EBP in almost all of the survey year. Number of children ever born and economic condition was found to be associated with EBP only for the surveys conducted in 2004, 2007, and 2011. Poor breastfeeding practices adherence to WHO guidelines indicate the immediate attention of the policy makers to take policies and programs to enhance breastfeeding practices in Bangladesh. Higher aged maternal women, higher socio-economic status, and currently working mothers should be given priority in future policies and programs.

INTRODUCTION

Breastfeeding is a unique way to provide ideal food for the babies in their first two years of life. It is crucial to improve the nutritional status and promoting child health by protecting various diseases (Tuan et al., 2014; Lutter, 2000). In addition, lower number of infant death (child age <1 month) and proper mental and motor development found to be associated with exclusive breastfeeding of child first six months of life (Black et al., 2008; Jones et al., 2003; Kramer & Kakuma, 2004; Oddy et al., 2003).

Because of nutritional and diseases promoting capability of exclusive breastfeeding, world community recommended breastfeeding as the globally recommended core package of nutrition intervention of child (Jones et al., 2003; Kramer & Kakuma, 2004; Oddy et al., 2003; Bhutta et al., 2008). However, developing countries frequently reported lower practice of such recommendations that further have contributed to the increasing childhood mortality and morbidity in this region (Hajeebhoy et al., 2014). Previous studies identified, inappropriate breastfeeding worldwide have contributed around 804,000 under five death, representing 11.60% of total under five death (Black et al., 2003; Lim et al., 2013). In developing countries, around 10% to 15% under five deaths were found to be preventable by initiating optimum (90.00%) coverage of breastfeeding (Jones et al., 2003). However, previous study of Bangladesh identified around half (40.90%) of the total under five death associated with inappropriate breastfeeding practices (WHO, 2013).

The WHO fights to ensure standard breastfeeding practices worldwide by recommending several indicators. Such recommendations include four key components: early initiation of breastfeeding (within one hour of

birth), exclusive breastfeeding (child receive only breast milk up to six month of age), and continued breastfeeding through one and two years (WHO, 2008). However, adherence to such global recommendations remains poor in Bangladesh (Jpshi et al., 2014; Hanif HM, 2013). More importantly, declined trend of EBP reported in the recent years (Hanif HM, 2013), though the reason of declining remain speculative (Tuan et al., 2014).

Previous studies in Bangladesh mainly examined the socio-demographic determinates of breastfeeding and its effect of child physical development (Mazumdar et al., 2012; Khan et al., 2013). However, previous studies were also limited to specific areas (urban or rural) and small sample size. In addition, none of previous studies examined all possible indicators of breastfeeding and its determinants. Therefore, to fill up these study gaps an attempt have taken in this study to assess the trend of breastfeeding practices and the determinants factors of EBP by using the nationally representative survey data.

DATA AND METHODS

Ethical issue

Data in this study were obtained from MEASURE DHS Archive collected by Macro, Calverton, USA. ORC Macro Institutional Review Board and Bangladesh Medical Research Council reviewed and approved the data collection procedure. Inform consent was obtained from each participant prior to subject enrollment (NIPROT, 2013).

Sources of data

This study used six nationally representative cross-sectional Bangladesh Demographic and Health Survey (BDHS) data. Descriptions regarding each of survey

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are included in Appendix table A1. National Institute of Population Research and Training (NIPORT) were conducted each of the surveys monitored by the Ministry of Health and Family Welfare in Bangladesh. Technical support was provided by ICF International of Calverton, Maryland, USA and financial support was afforded by USAID. Each of the surveys were based on household data of adults by covering each administrative division and rural and urban area separately. Each

Outcome

Four different Indicators of breastfeeding were calculated for each survey. Finally, determinants factors of EBP were investigated in multivariate framework.

Covariates

Different individual-, household- and community- level characteristics were included as the potential covariates. Individual level characteristics were mothers' age (≤ 30 years, >30 years), mother's educational status (illiterate, primary, secondary, higher), husband educational status (illiterate, primary, secondary, higher), mother's occupation (not working, any form of formal working), husband occupation (agricultural worker, services and non-agricultural labor, business and others), place of delivery (at home, health care institutions), antenatal visit

(no visit, ≤ 4 visit, >4 visit) and number of children ever born (≤ 2 , 3-4, ≥ 4). Wealth index (poorer, middle, richer) was considered as household-level characteristics. In addition, region and place of residence were considered as community-level characteristics.

Statistical analysis

Each indicator of breastfeeding practices was determined by using descriptive statistics with survey weight. Multivariate logistic regression models were used to evaluate the associated factors of EBP All analyses were drawn by Stata software version 13.1/MP (Stata Corp, College Station, Texas, USA).

RESULTS

Trend of four different indicators of breastfeeding practices were computed over the survey years presented in Table 1 and Figure 1. Only early initiation of breastfeeding showed the increasing trend from 9% in 1996-1997 to 47.8% in 2011; around 277% yearly increased. Around 10% (56.44% to 67.28%) increased of exclusive breastfeeding were reported during the first two surveys (1993-1994 and 1996-1997). However, considerably decreased trend of exclusive breastfeeding reported in the remaining survey's year reaching 56% in 2011. This study noticed around 95% and 85% continued

Table 1: Trend of the indicators related to breastfeeding from 1993-2011

Indicator	BDHS 1993-94	BDHS 1996-97	BDHS 1999-2000	BDHS 2004	BDHS 2007	BDHS 2011
Early initiation of breastfeeding	8.7%	13.70%	16.93%	23.62%	41.89%	47.81%
Exclusive breastfeeding under 6 months	56.44%	67.28%	65.78%	62.82%	60.00%	56.01%
Continued breastfeeding at 1 year	95.5%	97.20%	95.10%	94.95%	94.95%	94.95%
Continued breastfeeding at 2 year	86.99%	89.9%	86.92%	85.22%	85.10%	85.20%

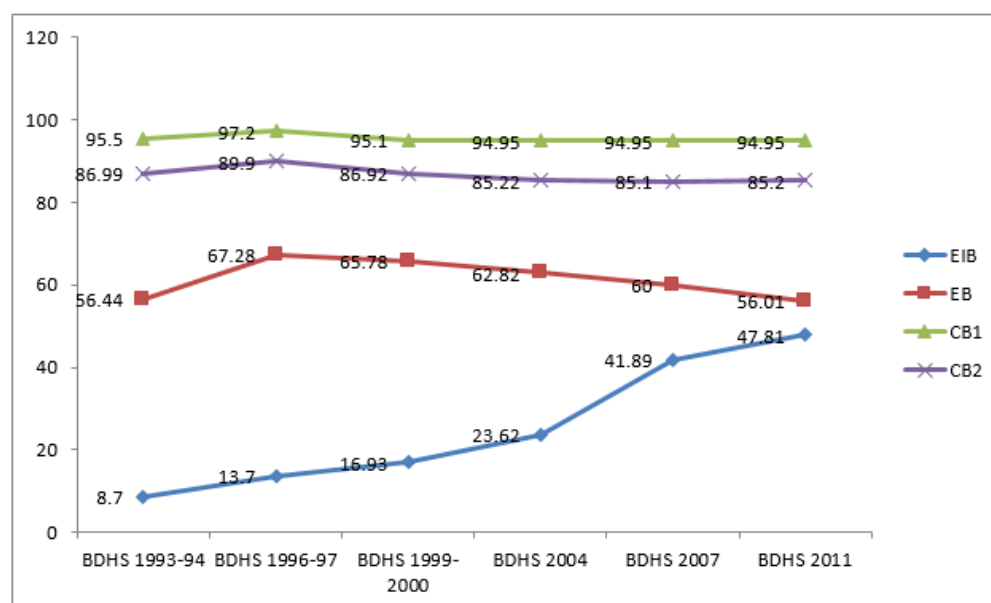


Figure 1: Trend of the determinants of breastfeeding

Table 2: Association between exclusive breastfeeding and multilevel factors

Variable	Model I Adjusted OR (95% CI)	Model II Adjusted OR (95% CI)	Model III Adjusted OR (95% CI)	Model IV Adjusted OR (95% CI)	Model V Adjusted OR (95% CI)	Model VI Adjusted OR (95% CI)
Mother age (in ears) ≤30 ® >30	1 0.902 (0.671- 1.212)	1 0.525 (0.434- 0.636)***	1 0.525 (0.434- 0.637)***	1 0.411 (0.348- 0.486)***	1 0.459 (0.388- 0.543)***	1 0.453 (0.395- 0.519)***
Mother's educational status	1 0.752 (0.598- 0.945)**	1 0.856 (0.724- 1.010)	1 0.855 (0.724- 1.010)	1 1.047 (0.899- 1.219)	1 1.131 (0.958- 1.334)	1 0.861 (0.741- 0.999)
Illiterate ®	0.684(0.482- 0.970)**	0.897 (0.698- 1.155)	0.897 (0.698- 1.155)	1.005 (0.834- 1.211)	1.314 (1.078- 1.601)	0.892 (0.755- 1.053)
Primary 1	0.572 (0.269- 1.210)	1.262 (0.755- 2.109)	1.262 (0.756- 2.109)	1.375 (0.983- 1.923)	1.606 (1.159- 2.225)***	1.086 (0.836- 1.411)
Secondary 2						
Higher						
Father's educational level	1 1.153 (0.900- 1.473)	1 0.930 (0.784- 1.104)	1 0.930 (0.784- 1.104)	1 0.897 (0.770- 1.045)	1 0.928 (0.789- 1.090)	1 1.081 (0.945- 1.237)
Illiterate ®	1.095(0.831-1.444)	0.753 (0.612- 0.925)**	0.753 (0.612- 0.925)**	0.909 (0.765- 1.079)	0.904 (0.751- 1.087)	1.056 (0.909- 1.226)
Primary 1	1.280 (0.800- 2.048)	0.796 (0.565- 1.123)	0.796 (0.565- 1.123)	0.806(0.620-1.048)	0.653 (0.500- 0.853)**	0.925 (0.750- 1.141)
Secondary 2						
Higher						
Place of residence	1 0.963 (0.717- 1.292)	1 1.035 (0.839- 1.278)	1 1.035 (0.839- 1.278)	1 1.133 (1.00- 1.297)**	1 1.033 (0.899- 1.188)	1 1.103 (0.984- 1.238)
Urban ®						
Rural						
Wealth index					1 0.870 (0.733- 1.032)	1 0.794 (0.692- 0.909)***
Poorer®	NA	NA	NA	NA		
Middle Richer					0.731 (0.617- 0.867)***	0.691 (0.602- 0.793)***
Place of delivery	1 0.586 (0.356- 0.959)**	1 2.093 (1.450- 3.023)***	1 2.094 (1.450- 3.023)***	1 2.416 (1.944- 3.002)	1 2.636 (2.167- 3.206)***	1 2.544 (2.240- 2.889)***
Home ®						
Health care institutions						
Antenatal visit (in times)	1 1.285 (1.015- 1.626)**	1 0.907 (0.767- 1.070)	1 0.907 (0.767- 1.070)	1 1.124 (0.980- 1.290)	1 0.998 (0.864- 1.155)	1 1.099 (0.976- 1.236)
No visit	0.959 (0.578- 1.590)	0.099 (0.079- 0.125)***	0.099 (0.079- 0.124)***	0.226 (0.190- 0.268)***	0.245 (0.206- 0.292)***	0.370 (0.322- 0.424)***
≤4 ® >4						
Children ever born	1 1.001(0.800-1.253)	1 0.903 (0.763- 1.067)	1 0.903 (0.763- 1.066)	1 1.149 (0.990- 1.333)	1 1.035 (0.887- 1.207)	1 1.164 (1.027- 1.320)**
≤2 ®	0.9466(0.689- 1.299)	1.017 (0.808- 1.279)	1.017 (0.808- 1.279)	1.584 (1.275- 1.969)***	1.263 (0.999- 1.597)**	1.372 (1.115- 1.688)**
3-4						
>4						
Father's occupation	1 0.889 (0.710- 1.112)	1 0.893 (0.758- 1.051)	1 0.839 (0.763- 1.066)	1 0.943 (0.814- 1.093)	1 0.987 (0.846- 1.152)	1 0.894 (0.792- 1.009)
Agricultural worker ®						
Services and non- agricultural labor	0.828 (0.650- 1.054)	0.927 (0.772- 1.115)	0.927 (0.771- 1.115)	0.990 (0.839- 1.169)	0.857 (0.716- 1.025)	0.915 (0.794- 1.054)
Business and others						
Mother's occupation	1 0.941 (0.714- 1.240)	1 0.796 (0.692- 0.913)**	1 0.796 (0.691- 0.917)**	1 0.757 (0.653- 0.877)***	1 0.762 (0.668- 0.869)***	1 0.632 (0.546- 0.730)***
Not working®						
Any form of formal work						

Note: 1 Primary completed is defined as completing grade 5, 2 Secondary completed is defined as completing grade 10
 ** 5% level of significance, ***1% level of significance‘®’, reference category’; ‘CI, confidence interval

breastfeeding up to 1 years and 2 years respectively with fluctuated trend in the recent years.

We performed six different multivariate logistic regression models with accounting complex survey design presented in Table 2. Maternal age, education, place of delivery, number of antenatal visit and mother's occupation found as a significant predictor of EBP in all survey years. In addition, wealth index (BDHS, 2007; BDHS, 2011), respondents place of residence (BDHS, 2004) and the number of children ever born (BDHS, 2004; BDHS, 2007; BDHS, 2011) were reported significant predictors in some surveys.

We found significant protective role of higher maternal age on EBP in all surveys. It was found that mothers aged 30 years and more were 47.50% (OR, 0.525; 95%CI, 0.434-0.636) less likely to be exclusive breastfeeding in BDHS, 1996-97 & 1999-2000. However, this risk was 54% (OR, 0.459; 0.388-0.543) lower in BDHS 2011. Around 1.61 (OR=1.606, 95% 1.15-2.22) times of higher odds of EBP reported among higher educated mothers. This finding is consistent for all others surveys though not statistically significant. Rural mothers reported 1.133 times (OR, 1.133; 95% CI, 1.00 -1.297) more likely to EBP in BDHS, 2004; similar direction with insignificant findings of others surveys.

Socio-economic status of the women measured by wealth index also found as important predictors of EBP having improved socio-economic status with lower EBP. Around 27% (OR, 0.731; 95% CI, 0.617-0.867) and 30% (OR, 0.691; 95% CI, 0.602-0.793) lower risk of EBP were reported respectively for the survey's year 2007 and 2011. Place of delivery was also found to be significant predictors of EBP in all surveys. Delivery with any form of health care institute found to be responsible factors of around 2.64 (OR, 95% CI, 2.167-3.206) times higher odds of EBP for the survey 2011. Result were similar directed in others surveys except survey conducted in 1993-1994 where 41.40% (OR, 0.586, 95% CI, 0.356-0.959) times less EBP in the same category. Interestingly, we noticed protective role of WHO recommended at least four antenatal visits on EBP. This risk was 63% (OR, 0.370, 95% CI, 0.322-0.424) lower in 2011 surveys. In addition, mothers' larger parities were found to be significant promoting predictors of EBP. We found around 1.37 times (OR, 1.372, 95% CI, 1.115-1.688) higher risk of EBP in last survey among mothers with 4 and more children during whole reproductive life. Results were similar directed for others survey. Working mothers reported around 37% (OR, 0.632, 95% CI, 0.546-0.730) lower risk of EBP in 2011 survey. Around 25-29% lower risk of EBP reported in case of others surveys among the working mothers group.

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DISCUSSION

In this, the first nationally representative study in Bangladesh that address trend of four different indicator of breastfeeding practices and changes of determinant factors of EBP. This study found increasing trend of early initiation of breastfeeding and declined trend of exclusive breastfeeding. However, on average similar pattern were reported in case of continued breastfeeding up to 1 and 2 years over the survey years. Multivariate logistic regression models identified maternal age, education, place of delivery, number of antenatal visit and mother's occupation as a significant predictor of exclusive breastfeeding over the survey's years.

As a first idle food for the baby, early initiation of breastfeeding is the most decisive indicators of breastfeeding practice which is found to be positively increased in Bangladesh over the surveys years. It contributes to prevent child morbidity and mortality by supplying protective pathogenesis and favor to the newborn's colonization by initiating early skin to skin contact that additionally favor to regulation of body temperature, maintain the blood glucose and cardio-respiratory stability (Mullany et al., 2008; Esteves et al., 2014; Moore et al., 2012). Our study findings was consistent with previous study conducted in Bangladesh (Hanif HM, 2013). Importantly, our study indicate Bangladesh (47.8%) were in the better position compared to the two others neighboring countries India, (36.4%) (Patel A, 2013) and Pakistan (8.5%) (Hanif HM, 2011). However, a comparatively lower prevalence was reported for many others developing countries, including Sri Lanka (83.5%) (Senarath et al., 2012) and Ethiopia (93.8%) (Hori et al., 2011). The proportion continued breastfeeding up to 1 and 2 years had showed constant trend for the last three surveys by supporting other nationally representative study conducted in Bangladesh (Hanif HM, 2013). This percentage was larger than Pakistan (78.2%) (Hanif HM, 2011) and the United States (21%) (CDC, 2014).

The prevalence of exclusive breastfeeding under six month displays the unsatisfactory development until the year 2000 (56.44%-65.78%). Thereafter this proportion is gradually decreasing and it is around 56.00% in the last survey conducted in 2011. However, the percentage is

consistently higher than India (46.40%), Nepal (53.10%) (Dibley et al., 2010) and Uganda (50.00%) (Bbaale E, 2014). However our study findings was contradictory with the two others previous studies conducted in Bangladesh reported around 42.5% (Dibley MJ et al., 2010) and 64.10% (Hanif HM, 2013) exclusive breastfeedings.

We found maternal advance age associated with lower risk of EBP. Findings were consistent with others study conducted in Sri Lanka (Dibley et al., 2010), Ireland (Tarrant et al., 2011), Norway (Kristiansen et al., 2010) and Uganda (Bbaale et al., 2011). This may associated with the more working pressure in family and outside in the advanced ages (Bbaale E, 2014). Higher educational status of mothers was identified as another protective factors of EBP. Previous studies conducted in different developing countries across the world noticed similar tendency among higher educated mothers (Dibley et al., 2010; Bbaale 2014; Alemayehu T et al, 2009; Victor R et al., 2013; Onah et al., 2014; Tan KL, 2011). Associated working opportunity and more standard life style on which EBF practices are lower may associated with such findings (Bbaale E, 2014). Results were also consistent incase of not working versus any form of formal working mothers. Our finding was in similar direction in many others study (Tan KL, 2011, Haroun et al., 2008; Chudasama et al., 2009). Mothers without any form of formal work create chance to breastfeed their children in longer episodes which are seems difficult for working mothers. However, in the recent period government should come up with a new labor law that allows the mother of young children in longer leave (6 months) and an interval in working period to breastfeed their child (Hasasan et al., 2015). Our study findings also call for the policy arguments to initiate breastfeeding friendly work environment.

Father education and the place of residence were also found as significant predictors of EBP in some earlier surveys. This may due to higher family income associated with fathers advance education and the awareness about the importance's of EBP on child health (Victor R et al., 2013; Onah S, 2014). Similar factor may also responsible for higher EBP among urban mothers consistent with many others previous studies (Bbaale E, 2014; Pandey S et al., 2010).

We found who gave their birth in the health care institutions had breastfeed their child in longer duration. Our findings is supported by many others previous studies in developing countries (Patel A et al., 2013; Bbaale E, 2014; Victor et al., 2013). Availability of the quality of information in formal health care settings and periodical monitoring by health care institutions may be responsible for such findings (Bbaale E, 2014).

More importantly we found higher number of antenatal care visit were negatively associated with EBP by neglecting traditional expectations that increase number of antenatal visit associated with increase health awareness where EBP is important. However, our study findings was directly contradictory to others study conducted in India and

Tanzania (Patel et al., 2013; Victor et al., 2013). Reasons behind such contradictory findings may concentrate on the pattern of utilization of antenatal care services in Bangladesh. Normally, the higher educated mothers with improved socio-economic status received higher number of antenatal care services which were responsible factors of lower EBP identified in earlier studies (Dibley et al., 2010; Bbaale E, 2014). Longer duration of EBP was also found to be associated with larger parity. We cannot able justified our findings due to the lack of literature. In this study we also found short duration of EBP among the middle and richer socio-economic background mothers. Our findings is supported by many others previous findings in developing countries (Tang L et al., 2013; Wang W et al., 2014). This may associated with increased working pressure and modern feeding practices that being decreased the EBP among the mother in high socio-economic status.

Strength and limitations

The greatest strength of this study was to use six different nationally representative surveys data. All the survey conducted with high response rate (96.40%), appropriate statistical adjustments for the survey design and modeling for the confounding effects. However, the primary sources of limitation was he recall bias. Data were collected respectively from the mothers with last born the past two years (BDHS, 2011), three years (BDHS, 1993-94) and five years (BDHS, 1996-97, BDHS, 1999-2000, BDHS, 2004, BDHS 2007). Hence sometimes mothers might not have been in position to recall correctly all the events that took place from the time of breastfeeding initiation to termination.

CONCLUSION

Increasing rate of early initiation of breastfeeding reported in this study while exclusive breastfeeding reported decreasing pattern. Continued breastfeeding at one and two year showed the constant rate in the last three surveys. The factors associated with the exclusive breastfeeding were maternal age, maternal education, place of delivery, number of antenatal visit, children ever born and maternal occupation. Wealth index, place of residence and father's educational level also identified the significant predictors of exclusive breastfeeding in some surveys. Policies and programs are important from the country level to enhance EBP in Bangladesh.

Ethical Issues

Ethical issues (including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

Availability of the data

Data of this study derived from MEASURE DHS archive.

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Conflicting of interest: The authors declare that there is no conflicting of interest.

Appendix A1: summary of the surveys

Title of survey	Sample size (no. of households)	Sampling method
Bangladesh Demographic and Health Survey, 1993-94[17]	9681	Two-stage stratified sample
Bangladesh Demographic and Health Survey, 1996-97[18] (Mitra et al., 1997)	9099	Two-stage stratified sample
Bangladesh Demographic and Health Survey, 1999-2000 [19]	10268	Two-stage stratified sample
Bangladesh Demographic and Health Survey, 2004[20]	10811	Multi-stage stratified sample
Bangladesh Demographic and Health Survey, 2007[21]	10819	Two-stage stratified sample
Bangladesh Demographic and Health Survey, 2011[16]	18000	Two-stage stratified sample

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